3. On the Anatomy of *Chauna derbiana*, and on the Systematic Position of the Screamers (*Palamedeidæ*). By A. H. Garrod, M.A., F.Z.S., Prosector to the Society.

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(Plates XII.–XV.)

In his memoir "on the systematic position of the Crested Screamer (*Palamedea chavaria*)," published in the 'Proceedings' of this Society*, Prof. Parker has placed that bird among the Anseres, and away from the Rallidæ, with which it had been generally associated. In his "Classification of Birds"†, Prof. Huxley adopts the same view as Prof. Parker. Both these distinguished authorities base their opinions on anatomical considerations; it therefore behoves me to attempt to substantiate the different views expressed by me in my paper "on certain muscles of Birds, and their value in Classification"‡, as it is so considerably at variance with that of the authorities just mentioned.

The great extent to which the skeleton is permeated with air renders the features presented by the different bones of *Chuna* less distinctive than in the majority of birds. For this reason the soft parts will be first considered.

Cutaneous System. Pterylosis.—Nitzsch has described the pterylosis of *Palamedea cornuta* and *Chauna chavaria*; and, as might be expected, *C. derbiana* does not differ in any important particulars from the latter. As he remarks, the most striking point observed in the plucked bird is the extreme whiteness of the surface, which depends on the fact that the skin is almost universally emphysematous to the depth of nearly a quarter of an inch. On pressing with the finger, the characteristic crackling of a tissue filled with air is most marked, the only places in which it is absent, or nearly so, being the anterior surfaces of the upper ends of the tibia, and, to a less degree, two triangular spaces, equilateral, with their bases towards the middle line, situated one on each side over that part of each pectoral region which is near the head of the humerus, in the apex of the larger triangular surface bounded by the superior and axillary margins of the great pectoral muscle.

In the Gannet and the Pelican the skin is likewise emphysematous, but not exactly in the same way. In them the superficial surface of the cutis forms a plane surface, and the deep layer another, with the air-cells intervening between them, and the feather-quills traversing them. In *Chauna*, however, these two cutaneous layers are not definable, the whole presenting the appearance as if a non-emphysematous skin had been forcibly blown up, so as to cause its surface to be irregular and bubbled, more like an artificially distended mammalian lung than any thing else. The feathers and the semiplumes do not perforate the air-cells, but cause the skin to be indented where they are situated.

* P. Z. S. 1863, p. 511. † P. Z. S. 1867, p. 415. ‡ P. Z. S. 1874, p. 117.

The disproportionately massive appearance of the legs is also caused by the presence of air beneath the tessellated skin, which extends almost to the ungual phalanges of the toes.

The contour-feathers, many of them, possess a very feeble after-shaft, especially in the region of the nape, as found by Nitzsch in *C. chavaria*; and there is also a slight groove along the posterior surface of the rhachis of each.

The rectrices are twelve in number.

There are twenty-six remiges in one of my specimens; Nitzsch and Sundevall find twenty-seven. Of these ten are primaries, the fourth being the largest. Of the sixteen secondaries the distal twelve are subequal, whilst the proximal four decrease in size as they approach the elbow.

The tufted oil-gland is not strikingly large; it is somewhat flat, with a single orifice on each side, surrounded by a circle of half-inch feathers which constitute the tuft.

The tibio-tarsus is nude for its distal third, being there covered, as over the tarso-metatarse and digits, with small red polygonal scales.

The plumage is uninterrupted, there being no spaces without contour-feathers except the axillary cavities mentioned by Nitzsch, in which down-feathers only are to be found. The down-feathers are universally distributed. The nude neck-ring of *C. chavaria* is absent in *C. derbiana*. The feathers of the humeral tracts are considerably the strongest of the contour-feathers.

Looked at in its entirety the pterylosis of the Screamers is unique, and in no way approaches that of the Anserine birds.

Alimentary Canal.—The *palate* is elongate and triangular, with three longitudinal rows of papillæ, which are conical, large, and therefore comparatively few in front, smaller and more numerous behind. They all tend somewhat backwards.

The *tongue* is just over an inch long, and $\frac{3}{8}$ of an inch broad, its sides being parallel for nearly their whole length. The tip is obtusely triangular, with a small papillary fringe at its extremity, $\frac{1}{8}$ of an inch broad. The base is straight, and is edged with spines $\frac{1}{10}$ of an inch long, and shorter, directed backwards. The surface and lateral margins are quite smooth, the whole organ being flattened, slightly grooved longitudinally down the centre, and nowhere more than $\frac{1}{8}$ of an inch thick. At its base are two lateral juxtaposed protuberances, rough on the surface, and together equal in area to one third of its surface. There is no transverse constriction or oblique groove like that found on the surface of the tongue in some Anatidæ.

The *œsophagus* is uniform in diameter, no crop being even indicated; it is not capacious.

The *proventriculus* is peculiar. It is more than usually capacious, and is glandular only in a patch which occupies but a small portion of its surface. This patch (which is clearly shown in the representation of this portion of the alimentary canal in Plate XII. fig. 1, at its upper end, where the proventricular dilatation ceases) has a

narrow zonary belt of glands. It can, however, be seen that by far the majority of the glands are aggregated into a posteriorly situated patch. The only birds with which I am acquainted in which the proventricular glands do not form a zone, or an approach to one, are *Struthio* and *Rhea*. In the Gallinæ and Anseres they form a zone.

The glandular surface occupies a subelliptical space, 2 inches by $1\frac{3}{8}$ in its long and short diameters, in the upper and back part of the canal, with the long axis in the direction of the tube. Its lower end is $2\frac{3}{4}$ inches from the upper orifice of the gizzard. The gland-tubes are simple, not racemose, and average $\frac{1}{5}$ inch in length. The remainder of the area of the proventriculus, about five sixths of it, is covered with coarse and irregularly folded epithelium.

The *gizzard* is constructed on the usual type; it is decidedly small in proportion to the size of the bird (in the Anseres it is as conspicuously large), being much more elongate, narrow, and less muscular than in grain-feeders. Longitudinal folds plicate the triturating surfaces, which are smooth in the Geese, Ducks, and Swans.

The *spleen* is the size of a haricot bean, and of much the same shape. Its position is in no way peculiar; but, as in all birds, being placed *above* the gizzard, it tends to confirm the opinion that the latter organ is only the representative of the pyloric end of the stomach, the cardiac component of which is represented by the proventriculus.

The *liver* is composed of two simple rounded lobes, united by a narrow isthmus of hepatic tissue; the lobes are of nearly equal size; and there is a fairly voluminous gall-bladder.

The following table gives the intestinal lengths:—

	♂ ft.	in.	♀ ft.	in.
Small intestine	7	3	6	10
Large intestine	1	1	0	7
Cæca	0	3	0	2

The *duodenum*, with its characteristic bend round the pancreas, is more capacious than the rest of the small intestine; but it is not large, being about $\frac{1}{4}$ inch in diameter. The hepatic and pancreatic ducts enter it at the bend, $2\frac{1}{2}$ inches from the pylorus.

The pair of *cæca* present a condition unlike that found in any other bird with which I am acquainted. In that they are situated some considerable distance from the cloaca, they agree only with *Struthio* and *Rhea*. In the much larger Cassowaries the large intestine is not more than 7 inches long. In both *Apteryx* and the Tinamous, as well as in all other birds, the Anseres and Gallinæ included, the large intestine does not exceed 4 inches in length. *Chauna* in having a large intestine, the length of which is several times the diameter of the gut, agrees therefore with *Struthio* and *Rhea* only. These organs are figured in Plate XIII., they being opened up in fig. 1 to show their internal structure.

Instead of being smooth externally, the cæca are sacculated on two longitudinal bands. They are peculiarly capacious for their

length, and fusiform in general outline. The sacculating bands are not lateral, but on their outer and inner borders, being continued from the longitudinal fibres of the large and the small intestine. Their mucous membrane is not plicated when they are distended. It is only, among other birds, in *Struthio* and *Rhea* that the cæca are sacculated; in these, however, there is only a spiral twist like that in the cæcum of the hares and rabbits.

Each cæcum has a well-developed special sphincter muscle guarding its aperture of communication with the intestine; and what is more peculiar still is, that they do not open into the colon proper, but into a special cavity, a continuation of the main intestinal tube, but separated off by a very constricting sphincter from the colon, as well as by the ileo-cæcal valve from the small intestine. This ileo-colic cavity is $\frac{3}{4}$ of an inch long and about $\frac{1}{2}$ an inch in diameter when undistended. Its mucous membrane is like that of the cæca, much more delicate than that of the colon. The ileo-cæcal valve is a small slit-like opening, nearly $\frac{1}{4}$ of an inch long, with its lips projecting a little way into the ileo-colic cavity. The two openings of the cæca into the same cavity are one on each side of it, a little oblique in regard to it, and considerably larger in lumen. The opening into the colon is very constricted; beyond it the mucous membrane of the large intestine is, as Dr. Crisp remarks*, transversely plicated, to produce an appearance much like coarse valvulæ conniventes.

Nothing like the above-described condition is to be observed in any other bird, not even in *Struthio* or *Rhea*, in both of which, as typically, the cæca enter the commencement of the uniformly cylindrical colon by fair-sized orifices, not surrounded by a special sphincter. This being the case, I cannot agree with Prof. Parker's remark† that "there is nothing whatever in the digestive organs, which are extremely voluminous, to separate the bird from the Geese."

Respiratory Organs.—Prof. Parker‡ remarks, "the trachea and inferior larynx are truly anserine; for there are no inferior laryngeal muscles, the contractors of the trachea ending one third of an inch above the bifurcation, and only a delicate fan-shaped fascia going to the half-rings. Moreover the trachea itself, from being flat and cartilaginous, becomes round and then compressed, and osseous an inch above the bronchi, so that it cannot be mistaken for any other than the trachea of an anatine bird." In that the lower end of the trachea is of smaller diameter than is the tube higher up, in that in the same part the constituent rings are in close contact without scarcely any intervening membrane, in that there are two pairs of tracheal muscles running to the thoracic parietes, and in that the intrinsic lateral tracheal muscles end before they reach the bifurcation of the bronchi, the syrinx of the Screamers approaches that of some of the Anseres; but in that there is no special modification of the organ in the male, and in the absence of chondrification or ossification of what are generally present as dilating rings or half-rings

* P. Z. S. 1864, p. 16. † P. Z. S. 1863, p. 514. ‡ *Loc. cit.*

to the bronchi, the Screamers are not Anserine, and in the latter feature peculiar.

There is nothing remarkable in the rings of the windpipe, their interlocking producing the well-known key-pattern. The last two are greatly compressed laterally, so that the membranous bronchi, in each of which there are only a very few slender half-rings, arise quite close together. As can be seen from the figure, Plate XII. figs. 2, 3, 4, the lateral muscles of the trachea are peculiarly powerful; the upper extrinsic pair is inserted into the middle of the membrane which runs between the body of the coracoid bone and the corresponding limb of the furcula on each side; the lower close to the costal process of the sternum, at the back of the sterno-coracoid articular margin of the former bone. The intrinsic muscle on each side descends the windpipe to end by bifurcating opposite the origin of the sterno-tracheal muscle, and cease, its anterior portion higher than its posterior, six or seven rings lower down, some distance above the bifurcation of the bronchi. The above-mentioned extremely delicate nature of the commencing bronchial tubes is most peculiar.

The lungs present no special features of interest.

There are several myological characters which, though small in themselves, all go to form the exact definition of any group of birds, and aid in the determination of affinities. Among the more important of these are the presence or absence of the ambiens muscle* (which is of fair size in *Chauna*), the presence or absence of the femoro-caudal, the semitendinosus, and their accessory heads (which are all four found in *Chauna*). Having dwelt fully on the importance of these muscles in the paper just referred to, all I need remark on the present occasion with regard to them is, that there is therefore a difference between this bird and all the true anserine birds, in none of which is there ever a trace of the accessory semitendinosus. A reference to my paper on the muscles of the thigh of birds will show that in possessing all the five above-mentioned muscles the Screamers agree only with the Gallinæ and their nearest allies, the Rallidæ, Musophagidæ, Cuculidæ, Columbæ, and some of the Limicolæ.

With reference to secondary myological points, there are four which, in my estimation, deserve special attention. They are:—

1. The presence or absence of the *expansor secundariorum* muscle.
2. The presence or absence of a special muscular slip from the *biceps humeri* to the patagium.
3. The area of origin of the *obturator internus*.
4. The degree of development of the *tensor-cruris fasciæ*.

These will be considered separately.

1. *The presence or absence of the Expansor secundariorum muscle.*

Expansor secundariorum is the name which it is my habit to employ for a very small and peculiar triangular muscle arising from the quills of the last few (generally two or three) secondary

* *Vide* P. Z. S. 1874, p. 116.

remiges at the elbow. Its remarkably long and slender tendon, which frequently traverses a fibrous pulley on the axillary margin of the *teres* muscle, runs up the arm side by side with the axillary vessels and nerves to be inserted in the thorax, into the middle of a tendon which runs from the inner side of the middle of the scapular element of the scapulo-coracoid articulation to near the middle of the thoracic border of the sterno-coracoid articulation, at right angles to it when the fore limb is extended. This arrangement being found very well differentiated in the Storks, may, for the sake of convenience, be termed *Ciconine*. In *Chauna* it is exactly the same, as may be seen from the accompanying drawing (Plate XIV. fig. 1, *e.s*).

In the majority of the Gallinaceous birds the *expansor secundariorum*, with the normal origin from the secondary quills, has a different method of insertion, which has led M. A. Milne-Edwards to describe the muscle in the common Fowl as a part of the *coraco-brachialis* (*brevis*) in his superb work on fossil birds.

In the genera *Tetrao*, *Francolinus*, *Rollulus*, *Phasianus*, *Euplocamus*, *Gallus*, *Ceriornis*, and *Pavo*, the muscle instead of being inserted into the scapulo-sternal fibrous band above referred to, after blending to a certain extent with the axillary margin of the *teres*, ceases by becoming fixed to a fibrous intersection about one third down the *coraco-brachialis brevis* muscle.

In *Francolinus clappertoni* from among the Francolins, *Coturnix*, *Odontophorus*, *Ortyx*, *Eupsychortyx*, and *Numida*, the tendon does not go so far as the short *coraco-brachialis*, but ends either by simply joining the axillary margin of the *teres*, or by at the same time sending a tendinous slip behind it to the scapula. In *Argus giganteus* the tendon, running from the elbow, turns round the axillary border of the *teres* to end by joining a triangular muscular fasciculus, attached by its base to the upper portion of the thoracic surface, which appears to be nothing but a differentiation-off of the upper portion of the last-named muscle. In the *Cracidæ* this insertion into the scapula is also found, but it is tendinous, like the upper element of the thoracic band above described in the Storks and *Chauna*; and in them there is also a second tendinous slip from the axillary margin of the *coraco-brachialis longus* (Plate XII. fig. 5) (not the *brevis*). In the Megapodidæ also the attachment to the *coraco-brachialis brevis* is wanting, the tendon ending either by blending with the *teres*-margin, or running on to the scapula.

In the Ducks and Geese among the Anseres the tendons under consideration, when they enter the thorax, run towards one another and join, after having expanded out, in the middle line, in front of the œsophagus, and behind the trachea. In the Swans this arrangement is not found, the tendons ending in the ciconine manner, or by running to the upper end of the scapula; and in this respect *Sarcidiornis* resembles them.

From the tabular statement now exhibited (see p. 199) the nature as well as the presence or absence of this muscle can be determined in any special group of birds. The only Anomalogn athous birds in which I have found this muscle are the Coraciidæ.

2. *The presence or absence of a special muscular slip from the Biceps humeri to the Patagium.*

The *biceps humeri*, the main flexor of the arm, arises from the upper end of the coracoid bone, and from the upper portion of the flexor surface of the humerus. In certain birds this muscle sends off from its upper end a slender fusiform belly, which runs through the proximal portion of the patagium to join its marginal tendon near the middle of its course (Plate XIV. fig. 2). The presence or absence of this muscular fasciculus is a very constant character among closely allied birds. In the Table (p. 199) are recorded the names of all those birds in which, according to my experience, it is to be found. The only Anomalogonatous birds in which I have seen it are the *Caprimulgidæ*.

3. *The Area of Origin of the Obturator internus.*

It is not my intention on the present occasion to enter into the consideration of whether the muscle here called *obturator internus* is homologous with the same-named muscle in Mammalia; suffice it to say that it arises from the pelvic surface of the pubis and ischium, and ends by a tendon which is inserted into the outer surface of the head of the femur.

In a large number of birds, on looking at the pelvic view of this muscle when undisturbed, its shape is seen to be an elongated oval, occupying the obturator fossa, and covering the line of junction of the ischium and pubis. In another large number of birds, instead of being oval it is triangular, its posterior fibres expanding in such a way as to cover most of the pelvic surface of the ischium. There are a few birds in which an intermediate condition is found; they are, however, very few. In most there is not the least difficulty in deciding whether the *obturator internus* is *oval* or *triangular* (compare Plate XV. figs. 1 and 2). From the Table (p. 199) the arrangement existing in most birds can be found.

4. *The degree of Development of the Tensor-cruris fasciæ.*

To this point I have referred in my paper on the muscles of Birds*, where its relations are explained. "It is the superficial muscle of the outside of the thigh, covering the femur. It is flat and triangular in shape, and arises as a membranous expansion which covers the gluteus ii., from the lower two thirds of the posterior border of the iliac fossa in which that muscle is situated, and from the fibrous septum which separates that muscle from the gluteus iii. Further down it has origin also from the whole length of the ridge which separates the postacetabular area from the external lateral surface of the ischium, and which may be termed the postacetabular ridge, as well as from the posterior border of the ischium, as far forwards as its junction with the pubis, being here slightly overlapped by the semitendinosus. The fibres converge towards the knee; and the deep portion of the muscle blends in its course with the vastus externus, together with which it continues

* P. Z. S. 1873, p. 628.

forward to become part of the broad thin tendon which covers the knee and is inserted in the front of the tibia-head, the patella being situated in it, together with the long, slender, and flat tendon of the *ambiens* muscle, which is situated below it, running obliquely from inside and above, outwards and downwards. In many birds this muscle does not extend below the level of the femur, but ends inferiorly by blending with the vastus externus; and consequently, where such is the case, it evidently cannot, as it does otherwise, cover any of the flexors of the leg." Whether this postacetabular portion of the *tensor fasciæ* is present or absent can be found by referring to the Table (p. 199). There are not many birds in which it is very small.

As the Anserine affinities of the Screamers are being discussed, it ought to be mentioned that in all the former the great pectoral flexor of the wing is peculiarly elongate, and extends upwards above the *symphysis furculæ*, with its fellow forming a median raphe as an anterior continuation of the *carina sterni*. The only other birds in which this occurs are the Penguins. In the Screamers the great pectoral flexor is not large, and does not extend upwards above the middle of the furcula.

In the Anseres the extensor pectoral (second pectoral) is always very long and broad, reaching the lower end of the sternum. In *Chauna* it does not extend nearly to the posterior margin of the sternum, and it is not bulky.

Again, the muscles of the Anseres are always intensely dark in colour, whilst in the Screamer they are quite pale. In this respect the two groups differ in the same way as do the Seals and the Sirenia among Mammals.

Osseous System.—The skull, being that portion of the skeleton which is least permeated with air, will receive the greatest attention on the present occasion. With reference to it Prof. Parker remarks*, "All the skull and face, except at its two ends, conforms to the lamellirostral type." Prof. Huxley also places *Palamedea* in his group "Chenomorphæ," among the several features characterizing those birds being that "the lachrymal region of the skull is remarkably long." That such is not the case in *Chauna*, Prof. Parker has remarked in his article "Birds" in the Encyclopædia Britannica†.

It may be well before proceeding further to inquire more fully into the nature of the lamellirostral type. Prof. Parker tells us that "the great embryological distinctions between the skull and face of the Geese and Fowls are, first, that in the latter the space between the periotic mass and the superoccipital cartilage is a mere chink, in the latter a persistent oval space; and secondly, that the anterior parts of the face, viz. the præmaxillæ, prævomers [maxillæ], and dentaries are small and compressed in the Fowls, large and outspread in the sifting birds." A glance at the accompanying figures of the posterior surface of the skulls of a Magellanic Goose, a Derbian Screamer, and a Razor-billed Curassow will enable the reader to decide for himself which of the two groups, the Anseres or the Gallinæ, the

* P. Z. S. 1863, p. 514. † Enc. Brit. 8th edit. vol. iii. p. 712.

Screamer more closely approaches. It evidently does not share the peculiarities of the former, in all species of which the surface of origin for the pair of large extensor muscles of the mandible is characteristically compressed from side to side, and elongated from above downwards, at the same time that there is the pair of openings above the foramen magnum (figs. 1, 2, 3, p. 198).

Again, from a comparison of the inferior surfaces of the same three skulls, it is equally evident that in the Screamer the præmaxillæ, maxillaries, and dentaries agree with the same bones in the Gallinaceous bird in not being large and outspreading. The palate of *Chauna* is represented in fig. 4.

In the Screamers the skull is, no doubt, as in the Anseres, desmognathous, having the maxillo-palatines united across the middle line; but this character is not sufficiently important to compel us to unite the two groups; for if such were the case it would be necessary to give credence to an association of birds which is in other respects extremely unnatural. In the Capitonidæ, for instance, *Megalæma* is not desmognathous, whilst *Tetragonops* is so.

As before stated, in the Anserine birds the lachrymal region is specially long. This is least marked in the *Cereopsis* Goose (*Cereopsis novæ-hollandiæ*), where, however, it is clearly apparent. In *Chauna*, the lachrymal region is as short as in the Gallinæ, not in the least elongated.

In both the Anseres and Gallinæ the pterygoid bones have large faceted surfaces for articulation with the basisphenoid rostrum. In both groups these facets are situated very far forwards—quite at the anterior ends of the bones in the latter; in *Chauna*, however, these articulations are quite independent of the anterior ends of the bones (fig. 4), being nearly as far backward as the middle of their otherwise free moieties.

As to the quadrate bones, their cranial articulations are bifid, which is the case in all birds except *Struthio*, *Rhea*, *Dromæus*, *Casuarius*, *Apteryx*, the Crypturi, and *some* (most) of the Gallinæ. They do to a certain extent resemble the same bones in the Anseres in having the articular surfaces for the jugal arches situated some way behind the level of their mandibular articulations (not a Gallinaceous character), which latter they also resemble in configuration, the usually extended outer facet not running backwards and inwards as in most birds but not in the Gallinæ.

In the Gallinæ, as in the Crypturi, the pterygo-quadrate articulation is much longer than in other members of the class. In *Chauna* this is not the case.

In *Chauna* the angle of the mandible is much prolonged and upcurved, as in the Anseres, from which it however differs in not being deeply excavated in the interval between the upturned process and the inwardly-directed articular angle. It must be remembered that the mandible is much the same in the Gallinæ.

It must also be remembered that the Screamers are the only birds in which there are no uncinate processes to the ribs, as has been shown by Mr. Parker.

Fig. 1.

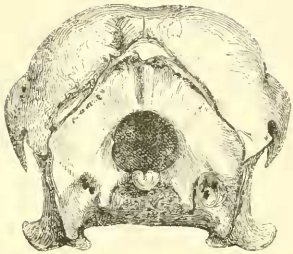

Fig. 3.

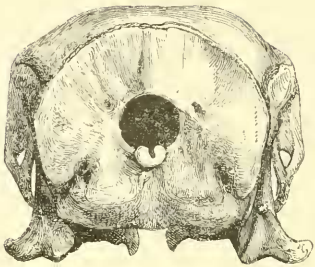

Fig. 4.

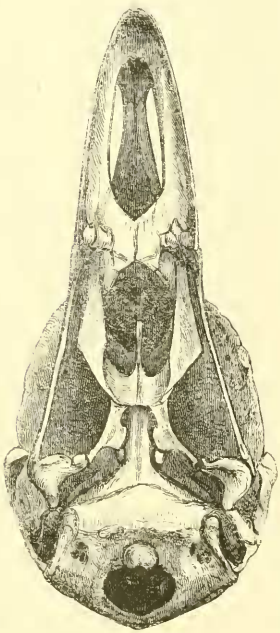

Fig. 2.

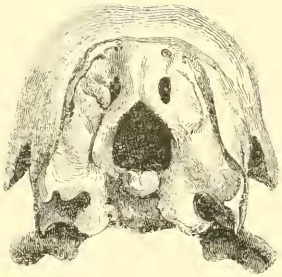

Fig. 1. *Chauna derbiana*. Back view of skull.
Fig. 2. *Chloëphaga magellanica*. Back view of skull.
Fig. 3. *Mitua tuberosa*. Back view of skull.
Fig. 4. *Chauna derbiana*. Base of skull.

TABLE.

Name of family.	Expansor secundariorum (see p. 193).	Biceps slip to the patagium (see p. 195).	Obturator internus (see p. 195).	Postacetabular portion of tensor fasciæ (see p. 195).
TINAMIDÆ	Ciconine.	Absent.	Triangular.	Large.
PALAMEDEIDÆ	Ciconine.	Absent.	Oval.	Absent.
GALLINÆ	Present (vide p. 194).	Absent only in Cracidæ.	Triangular.	Large.
RALLIDÆ	Ciconine.	Present.	Triangular.	Large.
OTIDIDÆ	Ciconine.	Absent.	Oval.	Present.
Cariama	Ciconine.	Absent.	Triangular.	Present.
Phœnicopterus	Ciconine.	Present.	Oval.	Present.
Serpentarius	Ciconine.	Absent.	Triangular.	Absent.
MUSOPHAGIDÆ	Ciconine.	Absent.	Triangular.	Present.
CUCULIDÆ	Ciconine.	Absent.	Triangular.	Present.
PSITTACI	Absent.	Absent.	.....	Absent.
ANATIDÆ	Ciconine in Cygninæ, peculiar in others (vide p. 194).	Present.	Peculiar from elongation of pelvis.	Present, except in Cygninæ.
SPHENISCIDÆ	.....	.....	Triangular.	Absent.
COLYMBIDÆ	Not seen.	Present.	?	Present.
PODICIPITIDÆ	Not seen.	Present.	Oval.	Present.
PROCELLARIIDÆ	?	?	?	?
FULMARIDÆ	?	?	Oval.	Absent.
PELARGI	Ciconine.	Absent.	Oval.	Absent, or extremely small.
CATHARTIDÆ	Ciconine.	Absent.	Triangular.	Present.
HERODIONES	Ciconine (not in *Cancroma* and *Egretta*).	Absent.	Triangular.	Absent, or extremely small.
STEGANOPODES	Absent.	Absent, except in *Phalacrocoracidæ*.	Oval.	Absent.
ACCIPITRES	Absent (not in *Falco*, *Polyborus*, and *Tinnunculus*).	Absent.	Triangular (exc. *Neophron*).	Absent.
STRIGIDÆ	Absent.	Absent.	Triangular (not *Scops*).	Absent.
COLUMBÆ	Feeble or absent.	Present.	Oval.	Present.
CHARADRIIDÆ	Ciconine.	Present.	Oval.	Present.
GRUIDÆ	Ciconine.	Present.	Triangular.	Present.
LARIDÆ	In some.	Present.	Oval.	Absent.
ALCIDÆ	Absent.	Present.	Oval.	Present (not in *Arctica alle*?).

In conclusion, it seems to me that from considerations of pterylosis, visceral anatomy, myology, and osteology, the Screamers cannot be placed along with the Anserine birds. In the windpipe and the form of the angle of the jaw they, no doubt, closely approach them. In their alimentary canal they are much nearer to *Struthio* and *Rhea* (not *Dromæus* and *Casuarius*) than to any other birds. There is a Ciconine tendency in their myology, whilst their osteology points in no special direction. It seems, therefore, to me that, summing these results, the Screamers must have sprung from the primary

avian stock as an independent offshoot at much the same time as did most of the other important families. It may be fairly asked what reason there is for the assumption that there was a sudden break up of the bird-type at any particular period. It appears to me from the study of anatomy that this was the case; and it is evident that the acquisition of wings by the previously terrestrial type form must have suddenly interpolated a large number of intruders into domains already occupied, and must have all at once called forth a new aerial struggle for existence, which, from the generalness of its action must, within a short time, have brought out a great number of special characters by natural selection.

EXPLANATION OF THE PLATES.

Plate XII.

Fig. 1. Proventriculus and gizzard of *Chauna derbiana*, cut open, and part of the front wall removed.
2. Anterior view of lower portion of windpipe of *C. derbiana*.
3. Back view of same, the muscles of the left side having been removed.
4. Right side view of same.
5. Portion of right coracoid bone (*c*) with *coraco-brachialis longus* (*c.b.l*) and *coraco-brachialis brevis* (*c.b.b.*) *in situ*, of *Crax globicera*. The *expansor secundariorum* (*e.s*) is seen to spring partly from the first-named muscle.

Plate XIII.

Fig. 1. Cæca of *Chauna derbiana*, with the anterior wall partly removed to show the cavity intervening between the small and large intestine into which the cæca open.
2. The cæca, external view.

Plate XIV.

Fig. 1. Axillary muscles of right side of *Chauna derbiana*. *e.s*, expansor secundariorum; *p* 1, great pectoral; *p* 2, second pectoral; *c.b.l*, coraco-brachialis longus; *b*, biceps; *t*, triceps; *t.p.b*, tensor patagii brevis; *sc*, scapula; *st*, sternum; *c*, coracoid; *f*, furcula; *h*, humerus; *c.v*, cervical vertebræ; *tr*, trachea; *S.R*, secondary remiges.
2. The same part, left side, of *Gallinula chloropus*. *B. slip*, biceps slip; *t.p.l*, tensor patagii longus.

Plate XV.

Fig. 1. Muscles of right side of interior of pelvis and inner side of thigh of *Chauna derbiana*, the muscles of the anterior abdominal wall having been removed. *o.i*, obturator internus; *Amb*, Ambiens; *Quad*, Quadriceps extensor; *Ad*, adductor; *s.t*, semitendinosus.
2. The same parts of *Euplocamus albocristatus*, similarly lettered. *sart*, sartorius.

4. Notes on Entozoa. Part III. By T. Spencer Cobbold, M.D., F.R.S., F.L.S., Correspondent of the Academy of Sciences of Philadelphia.

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(Plate XVI.)

In continuing the "Notes" commenced in 1873, I may observe that I have recently received important additions from naturalists